


Mastering Logic Macworld SF '06

David Mash
Berklee College of Music
dmash@berklee.edu
www.mashine.com
www.berkleemusic.com
www.berkleeshares.com
www.berklee.edu


Overview

- Goal: Acquire a deeper understanding of how Logic works, explore various approaches to managing workflow in Logic, and complete a musical project using Logic.
- Day 1: Understanding Logic
- Day 2: The music production process with Logic

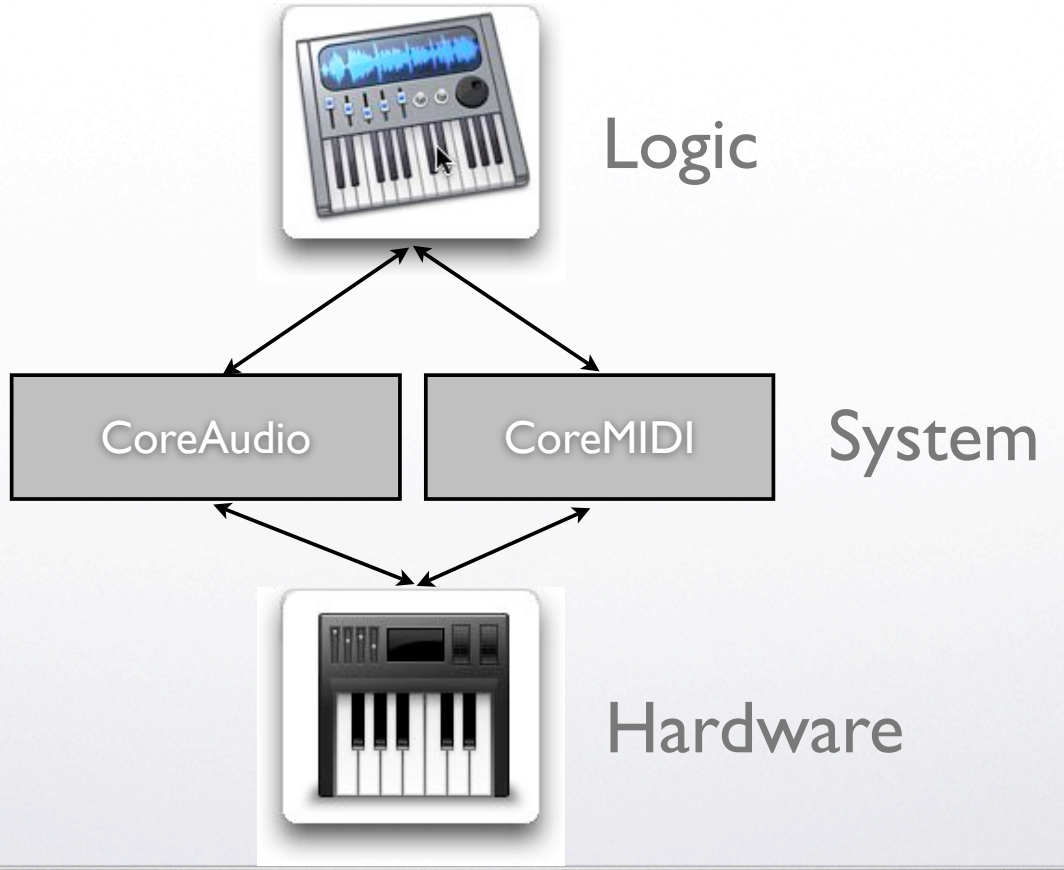

Day 1: Understanding Logic

- Setup & Structure
  - System setup
  - Logic setup
  - Managing files and projects
- Signal flow
- Recording, editing, & mixing
- Plug-ins


Setup & Structure

- System structure
- Logic and external hardware
- Program structure
- Managing files and projects

System Structure




Logic and External Hardware

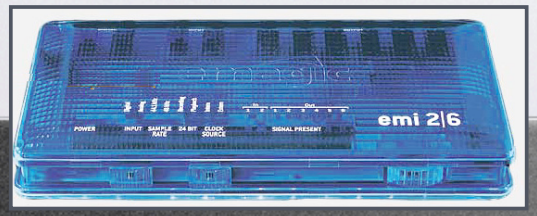
- Audio Interfaces
- MIDI Interfaces
- MIDI Devices
- Mixers


Audio Interfaces

- From least to most expensive:
  - Built-in (not available on all models)
  - USB:
    - Griffin iMic
    - Series of products from Edirol and M-Audio
    - Apogee Mini Me
  - Firewire
    - Edirol FA-101
    - M-Audio FW410
    - MOTU 828, 896
    - Metric Halo Mobile I/O
  - PCMCIA:
    - Digigram PCXPocket
  - PCI:
    - MOTU 1208, 2408
    - Digidesign ProTools HD

USB Interfaces

- Inexpensive
- Excellent for stereo applications
- Some will support surround
- Some support direct digital transfer via S/PDIF (optical or coaxial)
- Many provide MIDI as well as audio



FireWire Interfaces

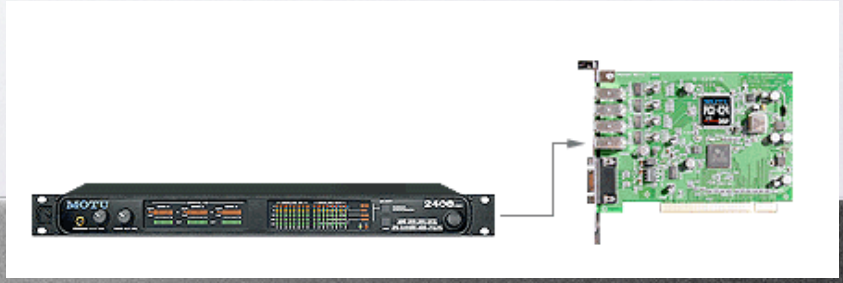
- Slightly more expensive than USB
- Much faster bus: 400mbps vs 12mbps
- Excellent for multichannel input/output
- Portable (between systems)
- Most provide MIDI as well as audio
- Direct digital transfer using ADAT, S/PDIF, or AES/EBU

PCMCIA (PC) Card Interfaces

- Highly portable
- High speed bus supports multichannel (4x4) audio
- Requires PowerBook (not iBook) with PC slot
- Uses proprietary breakout cable

PCI or PCIX Cards

- Feature DSP processing
- Use breakout box for I/O
- High sampling rates, high resolution
- Reduced load on the CPU




MIDI Interfaces

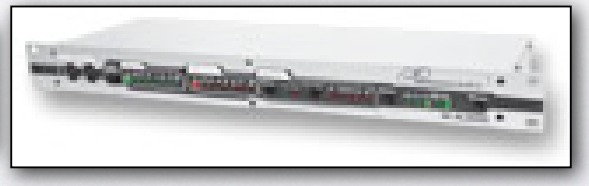
- Simple input/output
- Multiport
- Integrated Interfaces

Simple MIDI Interfaces

- Usually connects through USB
- Provides a single input and output
- Edirol (UM1-ex), M-Audio (MIDIsport 1x1, or Uno) are good choices:

Multiport Interfaces

- Multiple inputs and outputs
- Motu MIDI Time Piece A/V
- M-Audio MIDIsport 4x4 or 8x8
- Edirol UM-3ex



Integrated Interfaces

- MIDI input/output integrated into products with other functions
  - Keyboards
  - Audio Interfaces
  - Mixers


MIDI Devices

- Synthesizers & Samplers
- Instrumental Controllers
- Control Surfaces

Synthesizers & Samplers

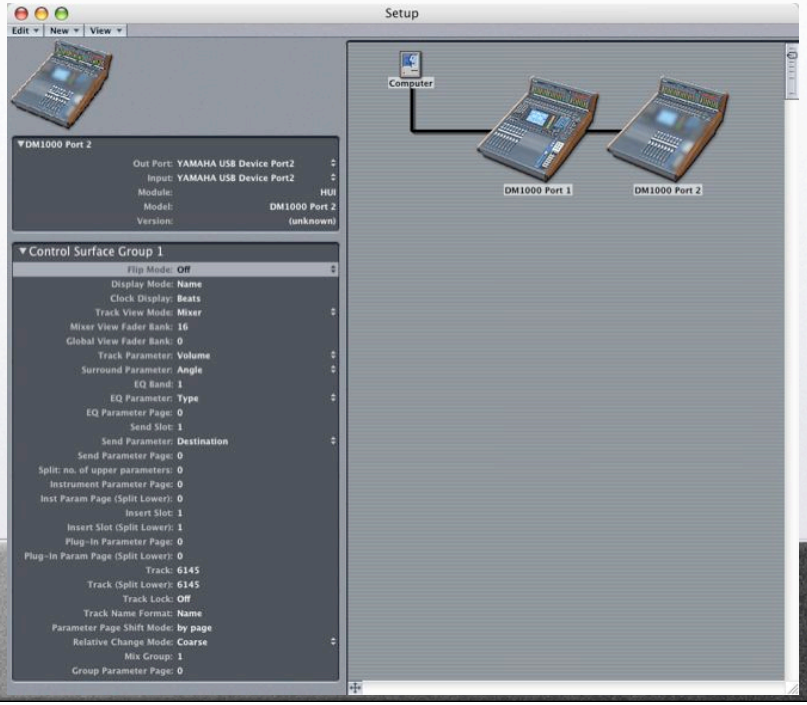
Instrumental Controllers

Control Surfaces

- Extended physical user-interface for virtual mixers and synthesizers
- May emulate “standard” controllers or provide unique approaches to human-machine interface

Control Surfaces

- Standard used in almost all software is the Mackie HUI (Human User Interface)
  - Mackie Control
  - HUI
  - Baby HUI
  - Yamaha Mixers
  - Tascam Mixers



Multifunction Devices

- Serve multiple purposes:
  - MIDI interface
  - Keyboard
  - Audio interface
  - Control Surface
- Novation Remote 25 Audio
- M-Audio Ozonic

Mixers

- Analog
- Digital with control surface


Mixers

- Simple audio mixer
- Automated
- Integrated control surface
- Integrated audio interface

Simple Audio Mixers

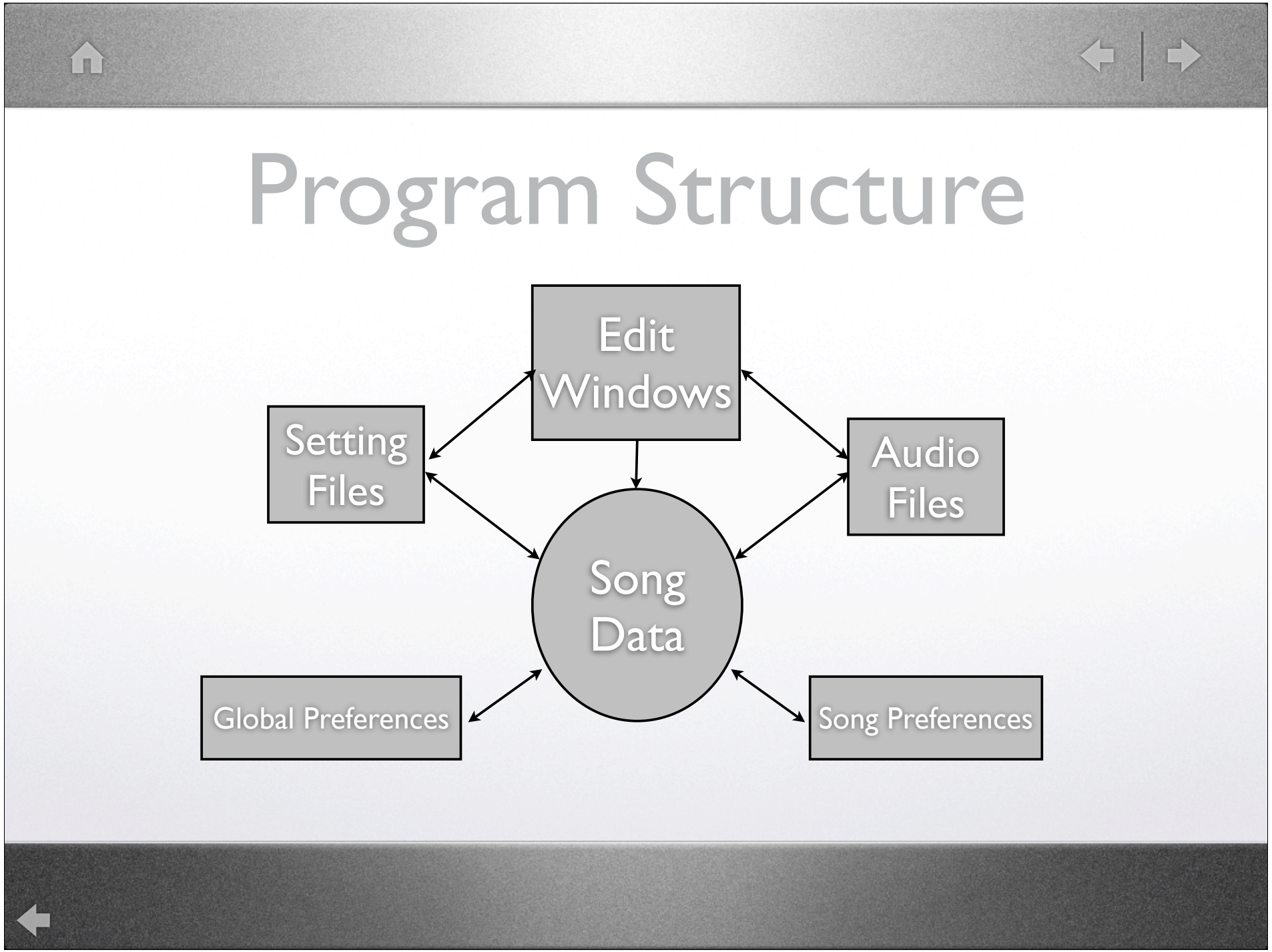
- Analog mixers:
  - Mackie
  - Yamaha

Digital Mixers

- Motorized Faders
- Control Surface
- Audio Interface
- M-Audio: ProjectMix I/O
- Tascam: FW1082
- Yamaha: DM 1000, 01X

Hardware Strategies

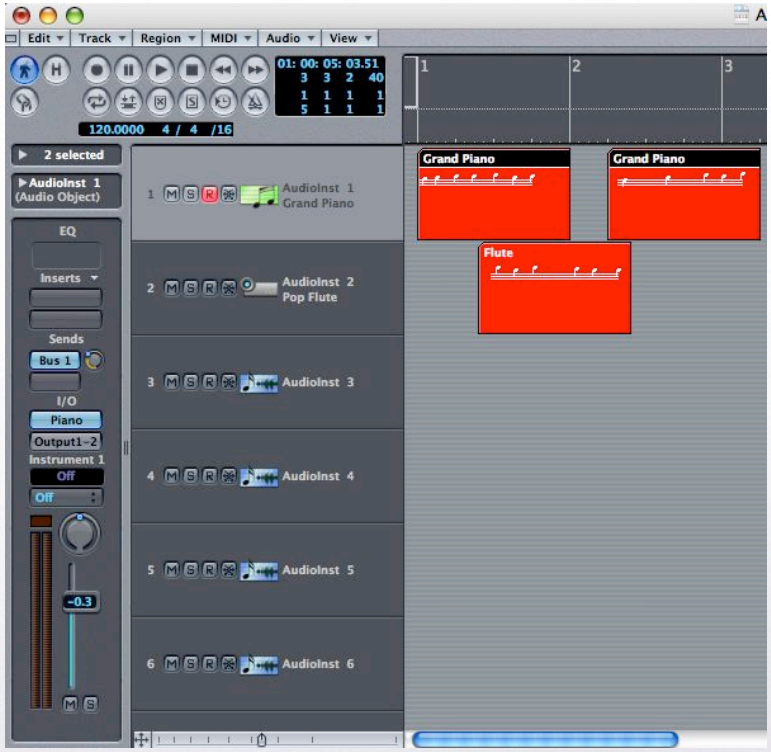
- Configure with Audio MIDI Setup
- Run Logic Setup Assistant
- Build from scratch in the Environment.



Program Structure

Logic Songs

- Song File
- Tracks
  - MIDI (External MIDI device)
  - Audio (Recording or Apple Loop)
  - Audio Instrument (Software Instrument)
  - Other Logic Objects
- Regions
- Data (MIDI or Audio)



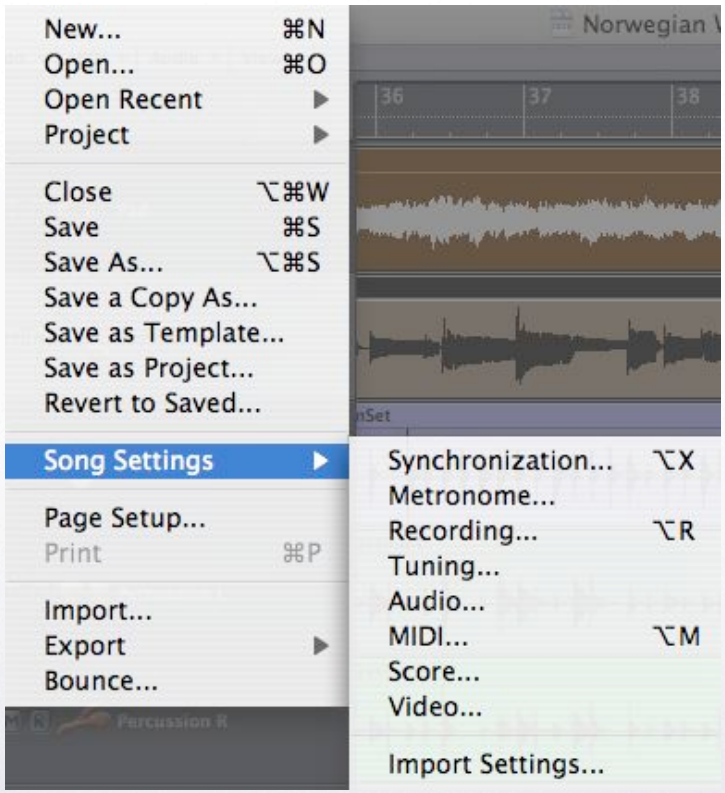

Managing Files and Projects

- Song files
- Preference files
- Settings files
- External files
- Projects


Song Files

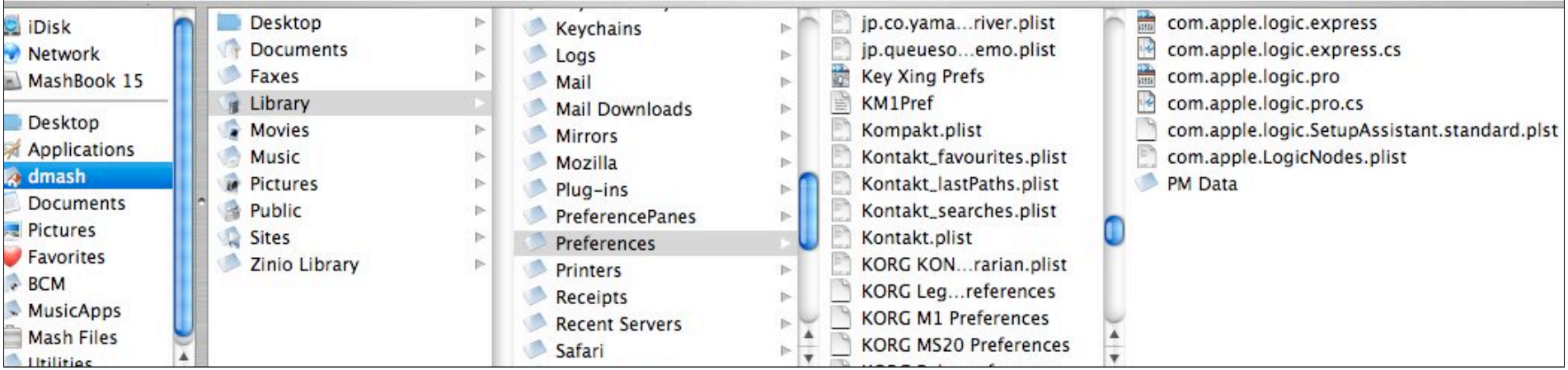
- Sequence information
- Pointers to external files (like audio)
- Settings used by all plug-ins
- Song Preferences (synchronization, metronome, recording, tuning, audio, MIDI, score, and video settings).

Song Settings

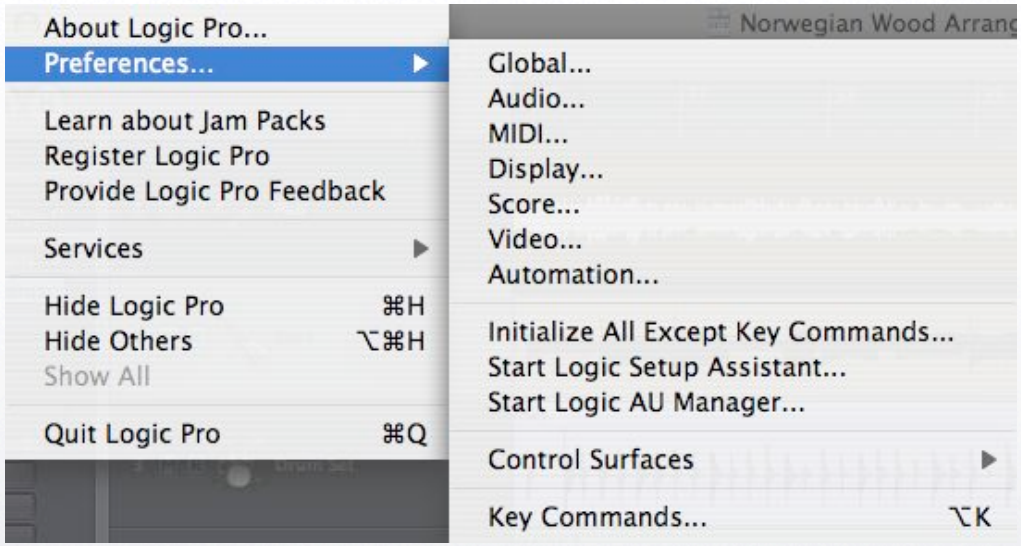


Preference Files

- com.apple.logic.pro: most preferences set within the program, including key commands
- com.apple.logic.pro.cs: settings for control surfaces
- com.apple.logic.SetupAssistant.standard.plist: basic hardware setup
- com.apple.LogicNodes.plist: nodes enabled in Logic
- PM Data: Project Manager file information

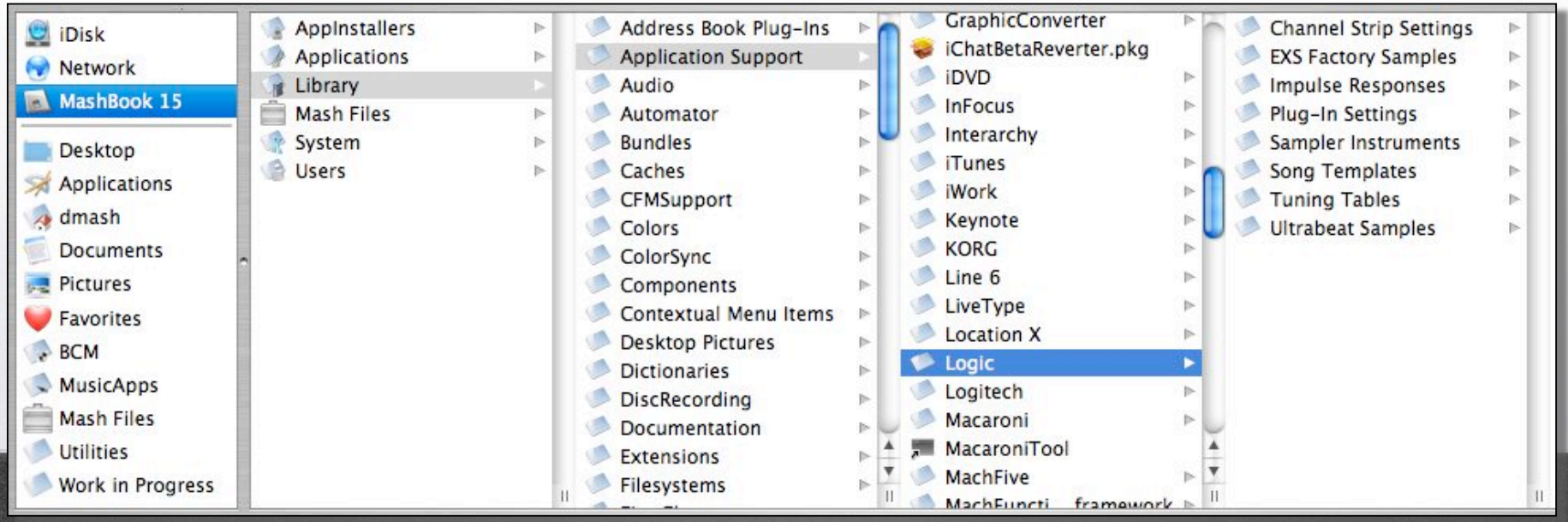


Global Preferences



Settings Files

- These files hold settings for various elements of the program: plug-ins, instruments, reverb impulses, and song templates.
- User settings are stored in the user library, factory settings in the root library

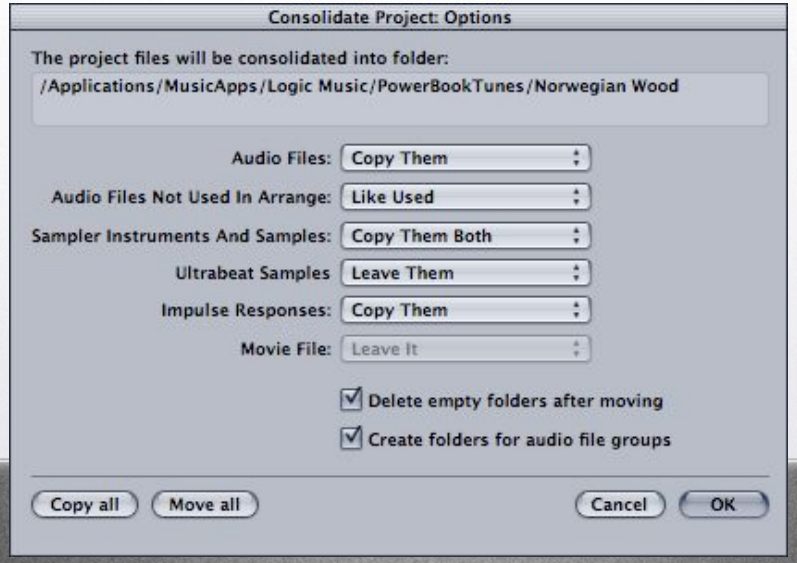



External Files

- These are files used by the Song file, but which are separate external files:
  - Audio files - audio files in any of a variety of formats used by the song.
  - Samples - sample files used by the EXS24 sampler instrument.

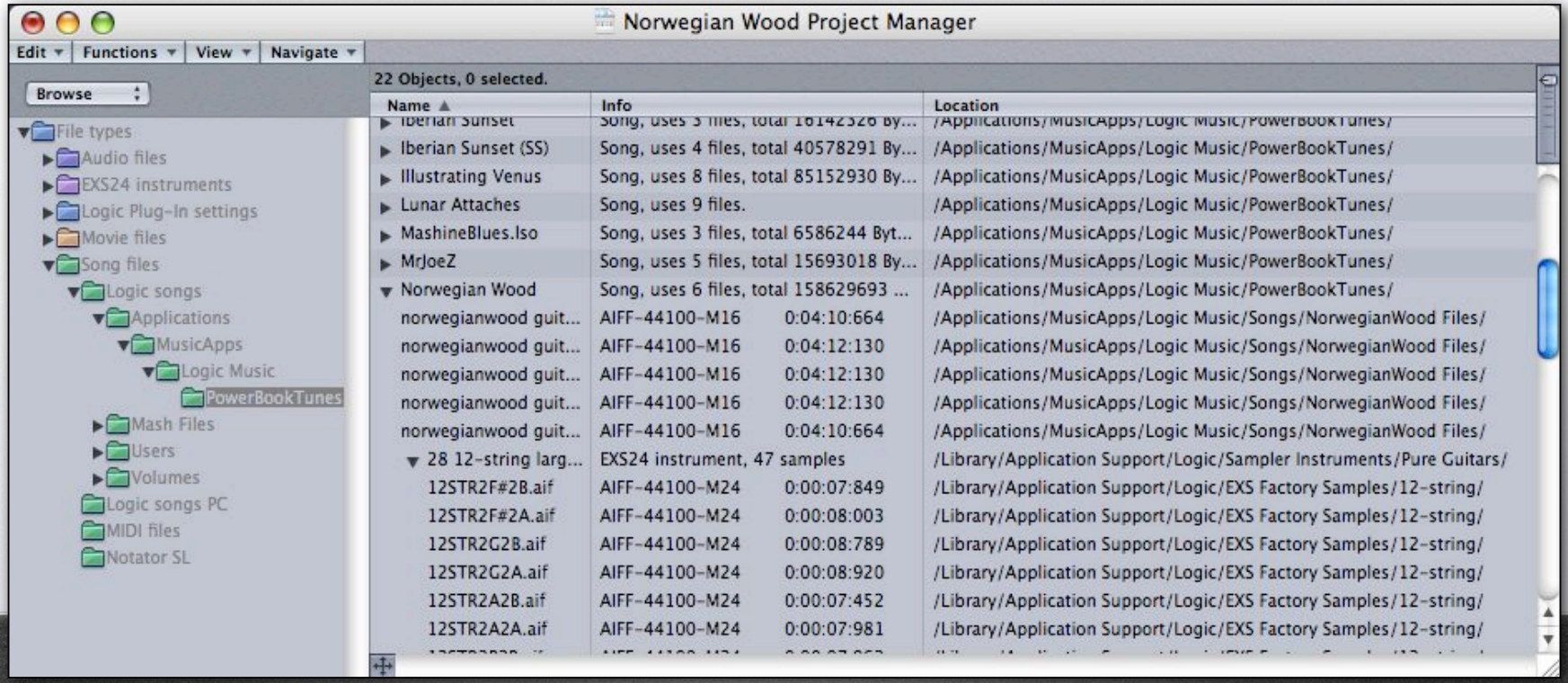
Projects

- A song may be consolidated into a project, which will aggregate all external files, settings, and preferences. A Project Folder can then be moved between machines and users with no problems.



Project Manager Window

- This editor window allows you to manage files used by Logic, both for the current song, as well as any files on mounted drives.

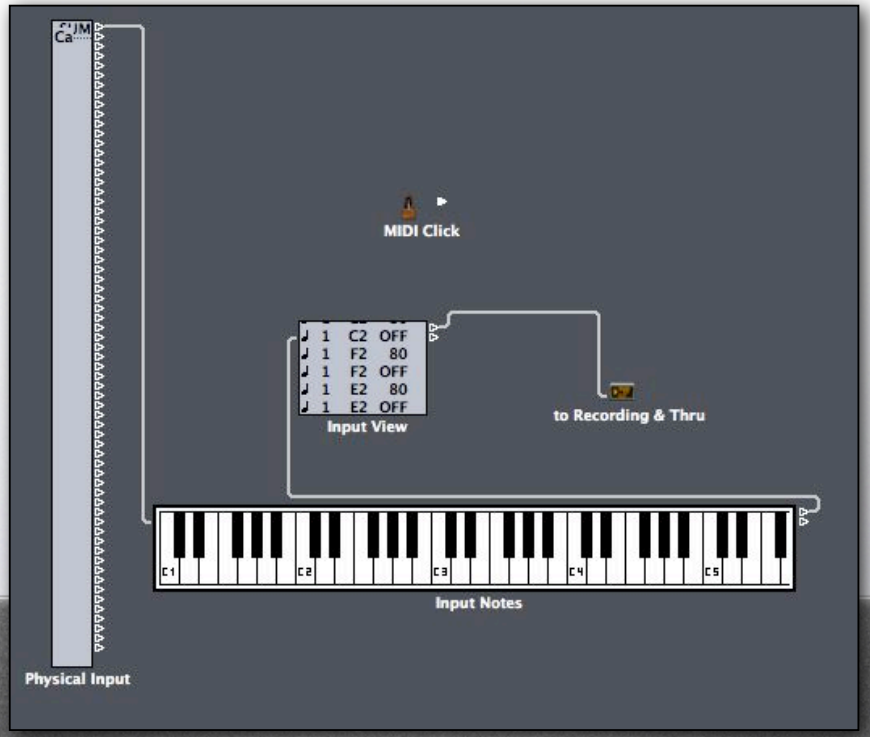



Signal Flow in Logic

- MIDI Data flow
- Audio Data flow
- Synchronization signal flow

MIDI Data Flow

- MIDI data enters from the physical input(s) and then is routed to Recording (sequencer) and through to selected track for realtime playback.

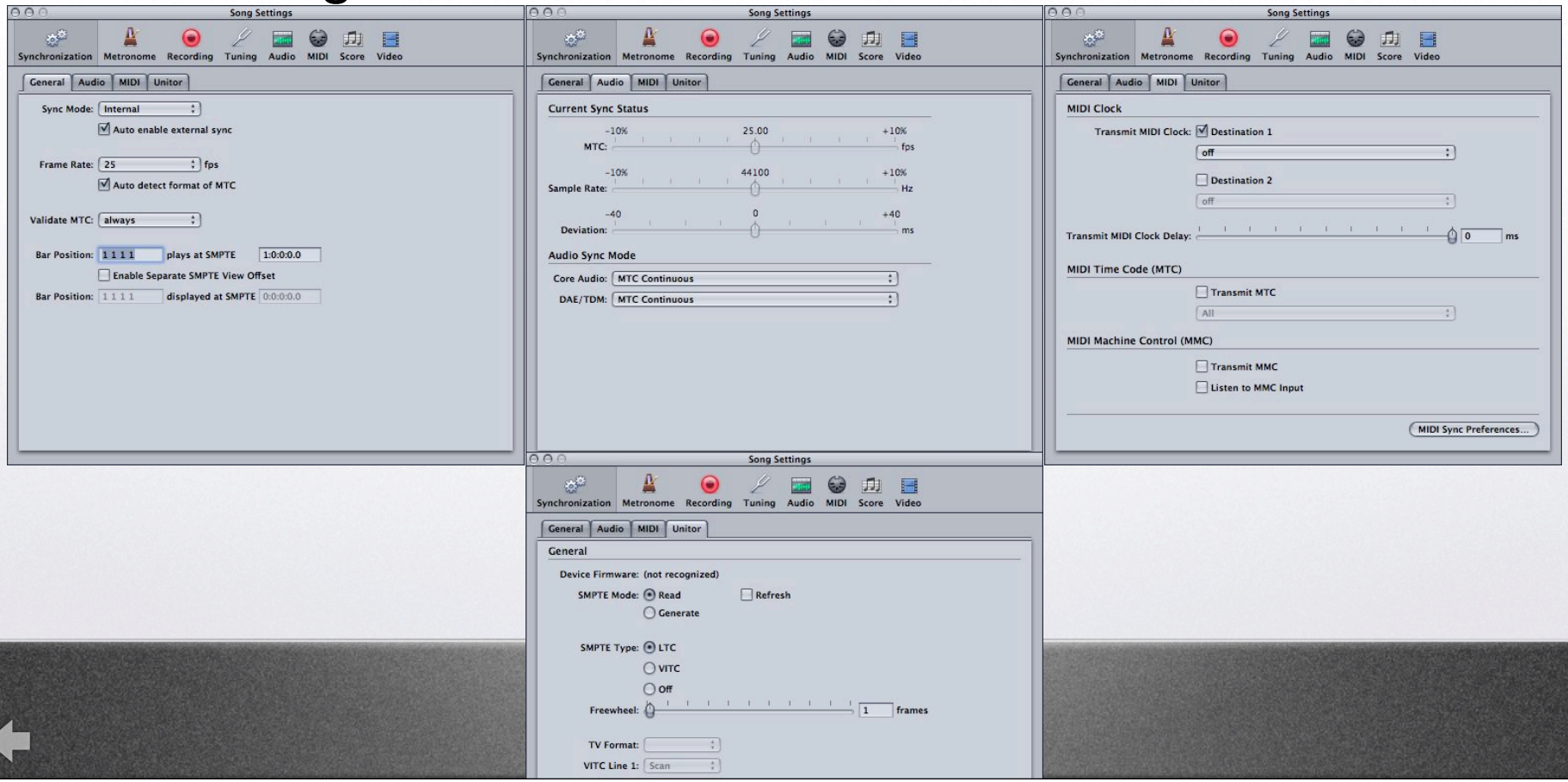


Audio Data Flow

- Audio data comes in through CoreAudio, DAE, or DTDM and then is routed through an audio object to a Track, Aux, Bus, Rewire channel, etc...

Synchronization

- Logic allows you to sync to an external clock, and to drive SMPTE signals to external devices.

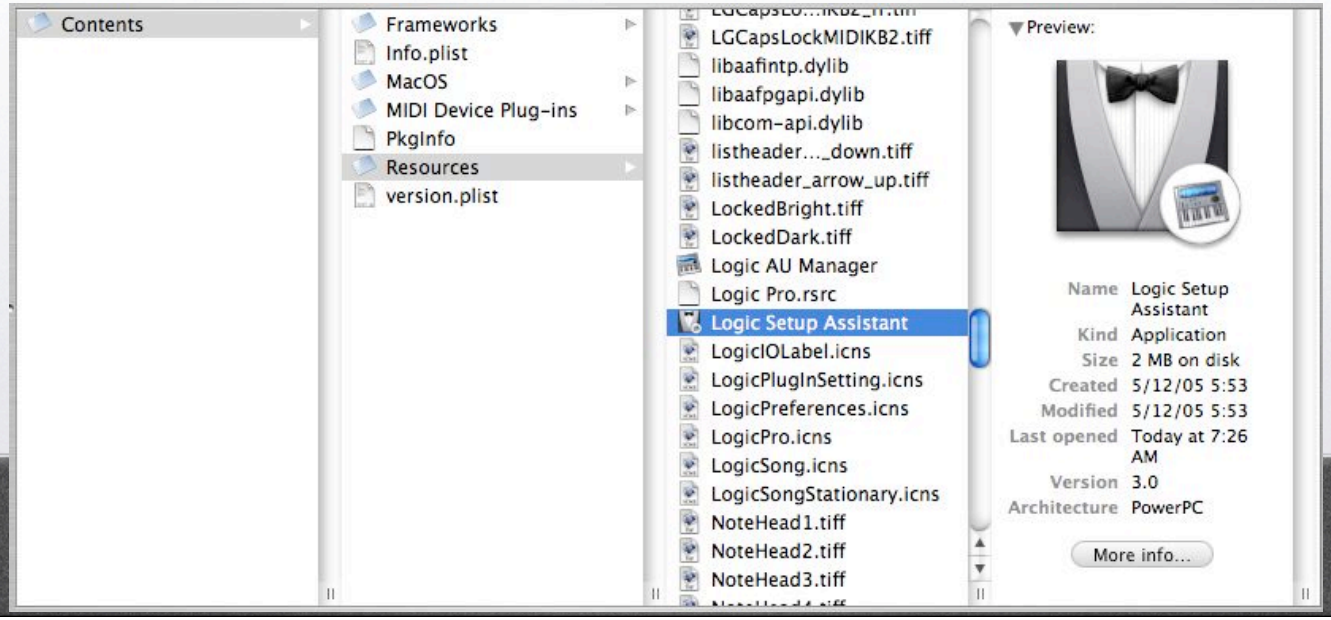



Setting up your System

- Logic Setup Assistant - Hardware
- Environment
- Screen sets
- Key commands
- Autoload

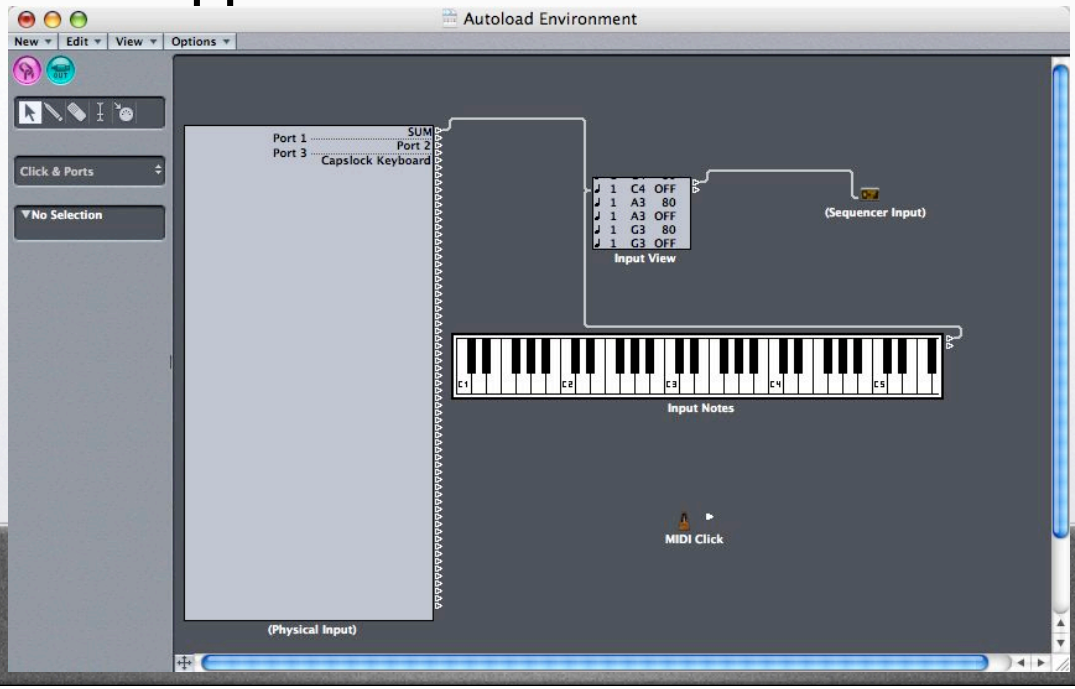
Logic Setup Assistant

- Runs automatically the very first time Logic is run after installation
- Can be run subsequently by:
  - Trashing the com.apple.logic.SetupAssistant.standard.plist preference
  - Launching the application from inside the Logic package:



The Logic Environment

- The Environment is a very powerful programming and routing platform within Logic.
- You can process and route MIDI data, route audio, and create complete mini-applications

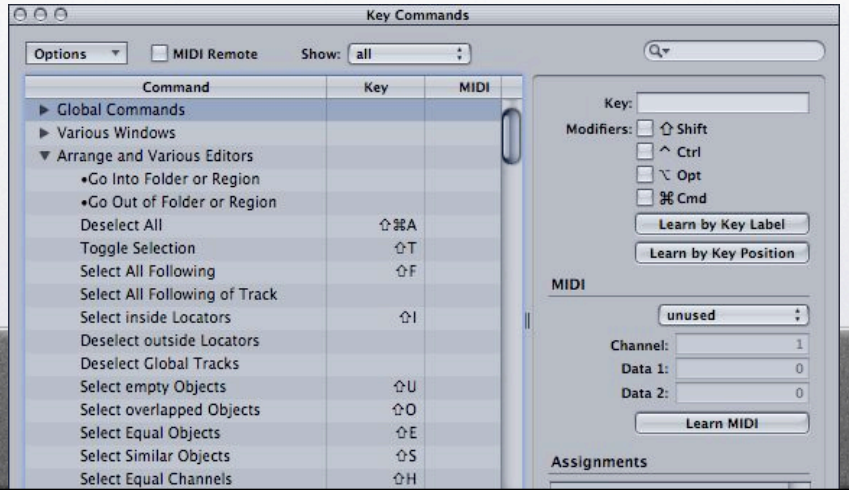



Screen Sets

- Logic allows for up to 99 Screen Sets, a memorized collection of windows, their content, and placement.
- Screen Sets give you the power to manage your workflow according to your personal style and needs.

Key Commands

- Logic allows you to completely configure the program to use whatever key strokes or MIDI input you want for just about any menu function.
- As powerful as Logic is with its many editing windows, menu options, and tools, there are also many features and functions that can be accomplished ONLY with Key Commands.




Autoload

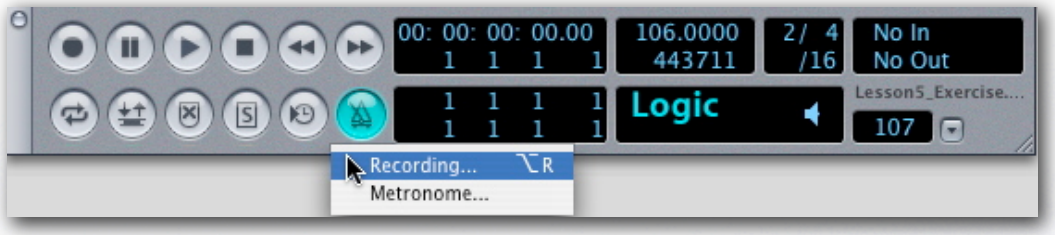
- Logic allows you to create templates for different purposes, and to store and recall these as the basis for new songs.
- The Autoload Song is a special template from which Logic creates all new songs when the “New...” File command is invoked.
- The Autoload stores all song preferences.


Recording in Logic

- Real-time entry
- Step entry
- Loop recording
- Punch in/out

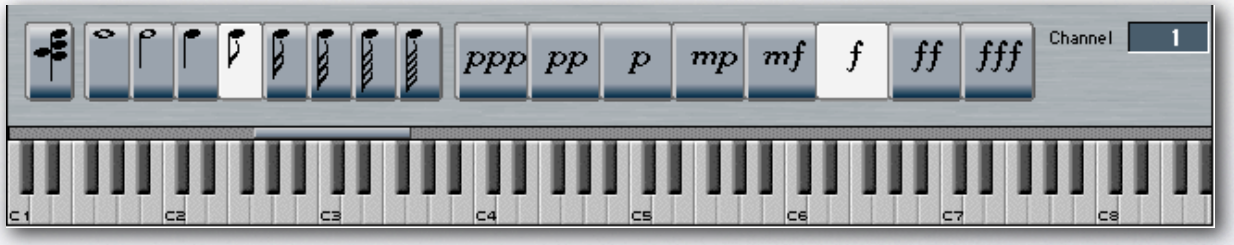
Real-Time Recording

- Best for musical performance
- Record-enable a track
- Metronome
- Count-off
- Record
- Stop



Step Entry Recording

- Particularly good for:
  - difficult instrumental passages
  - gestures such as glissandos and timpani rolls
  - certain techno and synth-pop/dance styles that depend on precision
- Set location
- Set rhythmic value
- Set note



Loop Recording

- Set loop location/length
- Metronome
- Count-off
- Record
- Other options:
  - Merge regions
  - Create new tracks
  - Auto mute

Punch-in/out Recording

- Good for repairing slight problems in otherwise good take
- Set in and out points
- Set metronome
- Set countoff
- Record


Editing in Logic

- Global
- Track
- Event
- Editing Windows


Global Editing

- These are edits that affect the entire song:
  - Tempo
  - Time Signature
  - Key
  - Length


Track-level Editing

- These are edits that affect a single track
  - Velocity
  - Dynamics
  - Gate time
  - Delay
  - Transposition


Event-level Editing

- These edits affect a single event, or range of events:
  - Pitch
  - Velocity
  - Volume
  - location
  - Duration


Editing Windows

- List Editor
- Graphic Editors
  - Matrix Edit
  - Hyper Edit
  - Plug-in Editors
- Notation Editor


Mixing in Logic

- Setting Levels
- Equalization
- Placing sounds in space
- Signal processing
- Stereo or surround mixdown

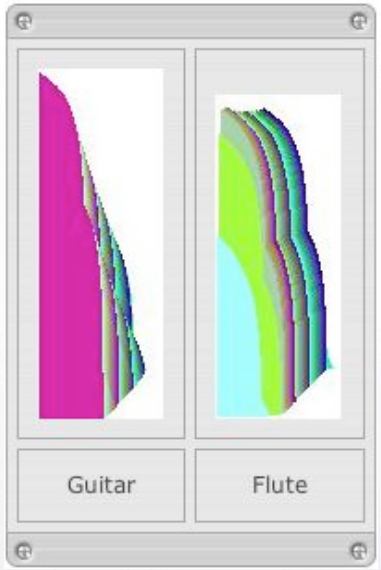
Setting levels

- Three places in a typical mixer to set levels:
  - Level coming into the mixer: Trim
  - Level to the channel strip: Channel Fader
  - Level of all channels to master mix: Master Fader


Equalization

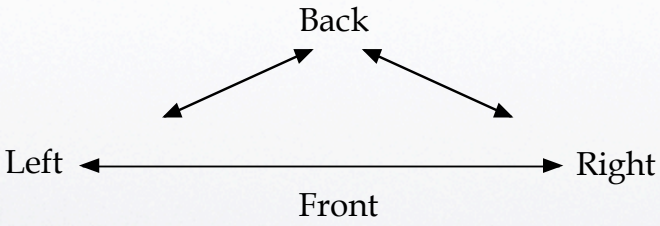
- Changing the spectrum of a sound
- Filters - Boost or cut range(s) of frequency
- Shelving filters
- Parametric EQ
- Graphic EQ

Comparing Spectra

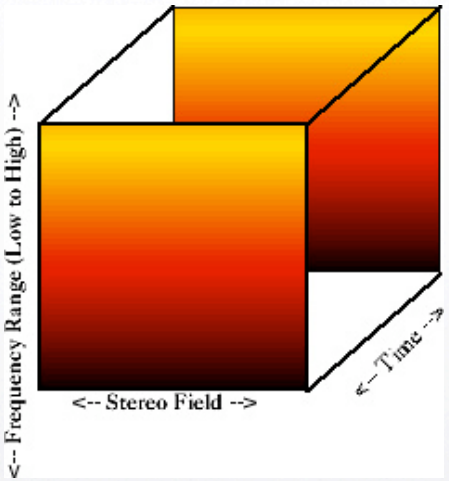


Placing Sound in Space

- Panning
- Reverb



Sound in 3D



Signal Processing

Category	Function	Effect
Dynamics	Changes the loudness of a recording	Compression Limiting Expansion Gating
Equalization	Changes the tone color of a recording	Cutoff Shelving Filter Parametric EQ Graphic EQ
Time-based	Delays a signal (Pitch-shifting is a special type of time-based effect)	Flanging Chorus/Doubling Slapback Delay Echo Pitch Shifting
Reverb	Creates multiple, randomly spaced echos that give a sense of space and location	Reverb


Mixdown

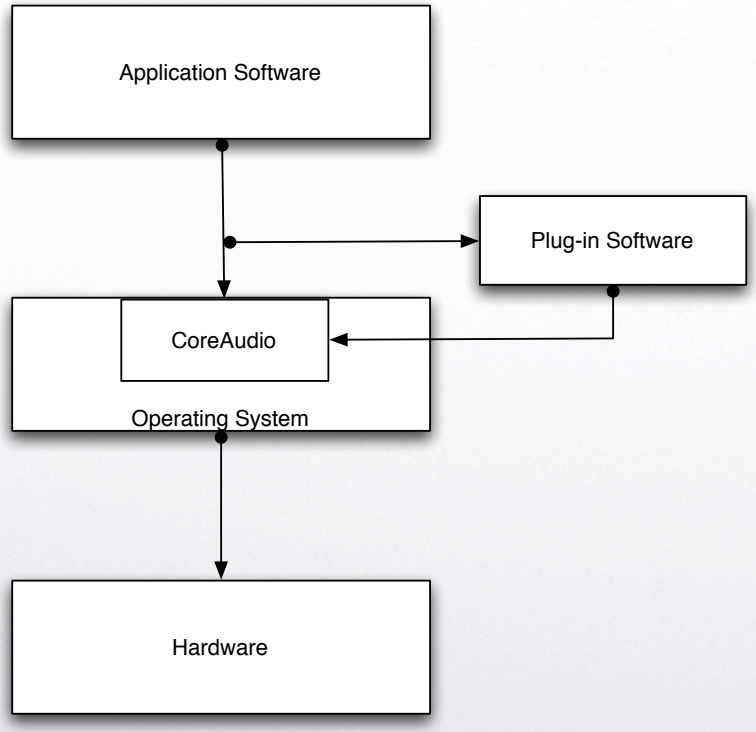
- Multiple track playback to stereo
- Multiple track playback to surround
- Bouncing to disk

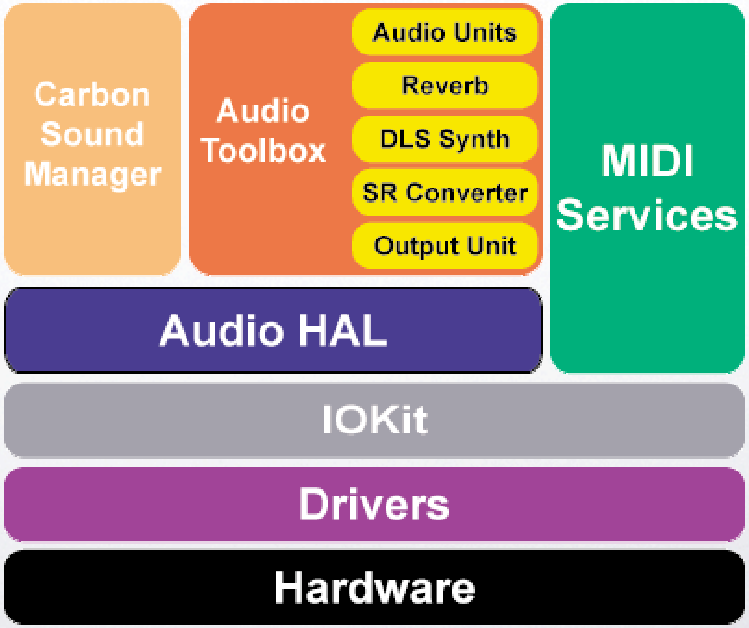
Plug-ins

- Logic Plug-ins (DSP & Instruments)
  - Native to Logic - optimized for performance inside Logic
- External Plug-ins (DSP & Instruments)
  - Generalized for use across software applications
    - Audio Units (DSP & Instruments)
    - TDM (DSP & Instruments)

What's a Plug-in?

- Software program that uses a host software application as a platform for operation



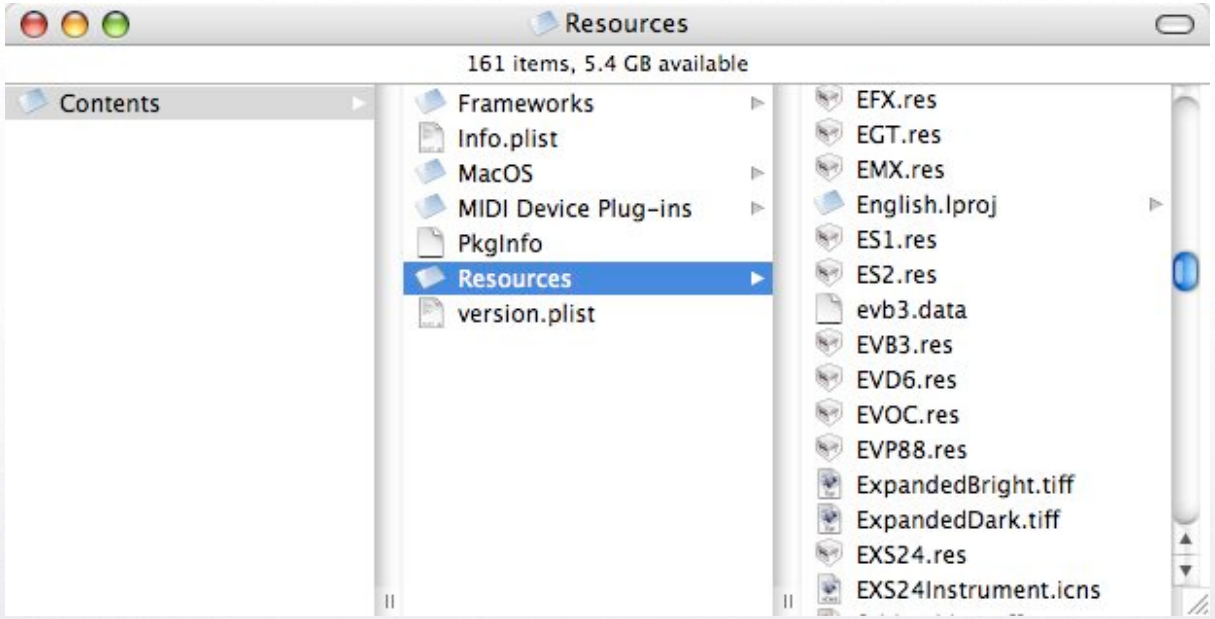



Plug-in Types

- Digital Signal Processor
- Software Instrument
- Logic
- Audio Unit
- TDM

Managing Plug-ins

- Logic Plug-ins are stored in the Logic Package: Logic Pro/Contents/Resources/



Managing Plug-ins

- External Plug-ins are stored in two possible locations:
  - /Library/Audio/Plug-ins
  - ~/Library/Audio/Plug-ins
- Audio Units in Components Folder
- Management:
  - Manual
  - Utility
  - Logic AU Manager


General DSP Categories

Category	Description	Example
Spectrum	These processors affect the tone color of a sound and allow us to equalize audio, create special tone-color effects like wah-wah, and help us create clarity in a mix.	Graphic EQ
Dynamics	These processors affect the loudness of a sound over time, and help us correct levels, increase the sustain of decaying sounds, and filter out background noise.	Compressor
Time-based	These processors repeat the signal over time and create a variety of musical effects such as reverb, chorus, flanging, echo, slap-back delay, and so forth.	Flanger

Spectrum: Filters

Filter Type	Filter Name	Function	Controls
Cutoff Filter	High Pass	Filters frequencies below the cutoff	Cutoff Frequency
Cutoff Filter	Low Pass	Filters frequencies above the cutoff	Cutoff Frequency
Shelving Filter	High Shelf	Boost/cuts frequencies above the cutoff	Cutoff Frequency Boost/Cut level
Shelving Filter	Low Shelf	Boost/cuts frequencies below the cutoff	Cutoff Frequency Boost/Cut level
Parametric	Parametric EQ	Boost/cuts frequencies around the cutoff	Cutoff Frequency Boost/Cut level Bandwidth

Dynamics Processors

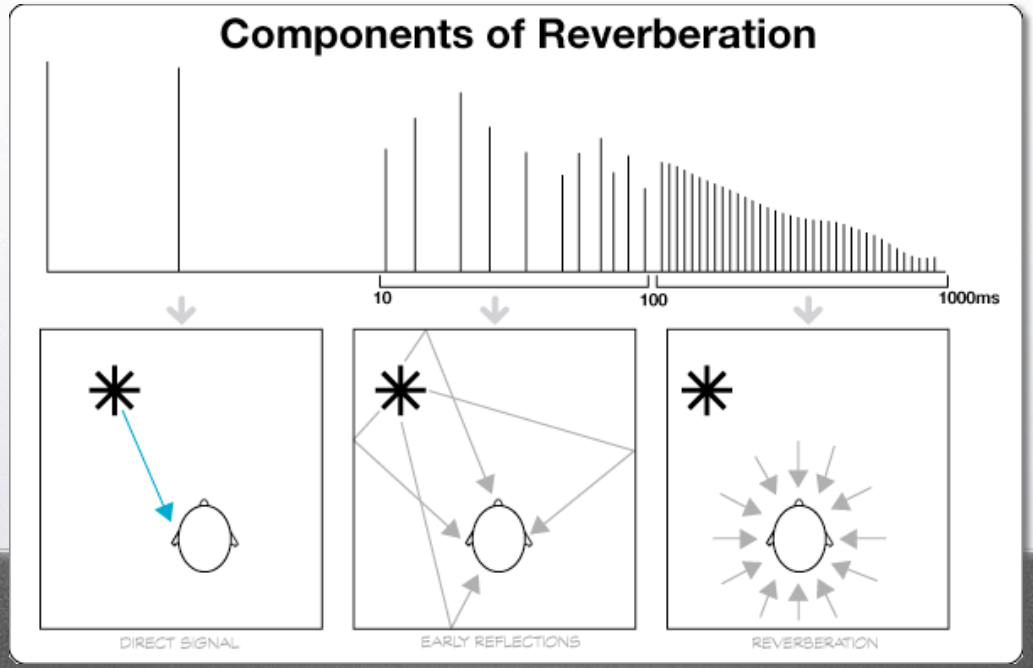
- **Compression:** The goal is to reduce the dynamic range of a signal and usually boost the overall output. The ratio is typically set between 2:1 and 4:1, and make-up gain is used to increase the level.
- **Limiting:** The goal is to ensure that a signal doesn't exceed the threshold. The threshold is set slightly below the maximum desired output, and a ratio of 20:1 or higher is used.
- **Expansion:** The goal is to increase the dynamic range of a signal so that quiet signals are reduced and louder signals are boosted. This is a common way to reduce noise in a recording, when a performer isn't playing.
- **Gating**: The goal is to only let signals pass that fall above the threshold, eliminating quieter signals.

Time-based Processes

Category	Type of Effect	Delay Time Range	Description
Delay Effects	Echo	150 ms and higher	Distinct multiple repetitions
	Slapback	50 ms - 150 ms	A quick, discrete repetition
	Doubling	20 - 50 ms	The sound of two instruments playing in unison
Modulation Effects	Chorusing	5 ms - 20 ms	A full shimmering sound
	Flanging	.01 ms - 5 ms	A repetitive deep filtering effect

Reverb - Space Processing

- Reverb: creating an sense of space
  - the sound we hear directly from a source
  - the first sounds reflected from nearby surfaces called early reflections
  - multiple waves of reflected sound as the sound from the original source continues to be reflected




Software Instruments

- Emulated Instruments
- Samplers
- Synthesizers

Logic Emulated Instruments

Electric Piano
EVP88

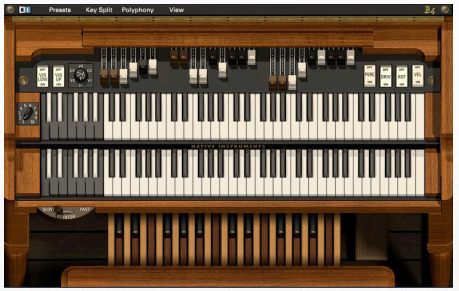
Organ
EVB3

Clavinet
EVD6

AU Emulated Instruments

Electric Piano
NI Elektrik Piano

Organ
NI B4



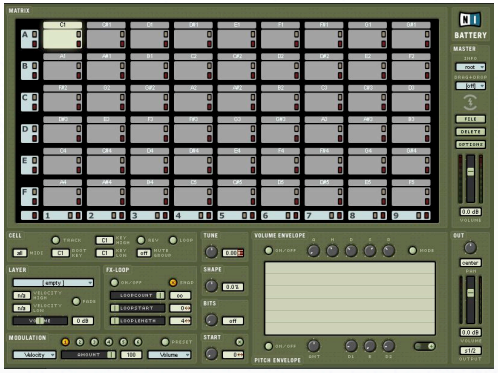
Melotron
G-Media M-Tron

Logic Drum Machine

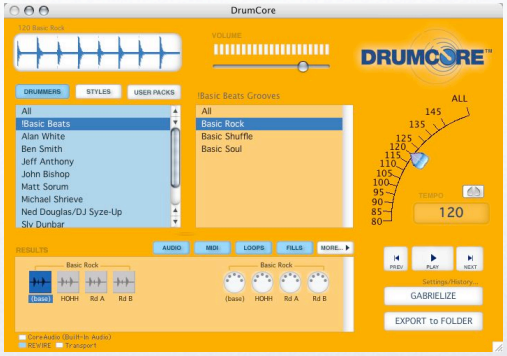
Ultrabeat

External Drum Machines

Native Instruments: Battery



Submersible Music: DrumCore




Samplers

- Emagic EXS24mkII
- Popular AU Samplers
  - MOTU Mach Five
  - Native Instruments Kontakt
  - IK Multimedia SampleTank
- Popular Libraries
  - Vienna Symphonic Library
  - Garritan Personal Orchestra
  - EastWest SoundsOnline
  - Spectrasonics


Synthesizers

- Retro Emulations
- Modern approaches
- True Modular

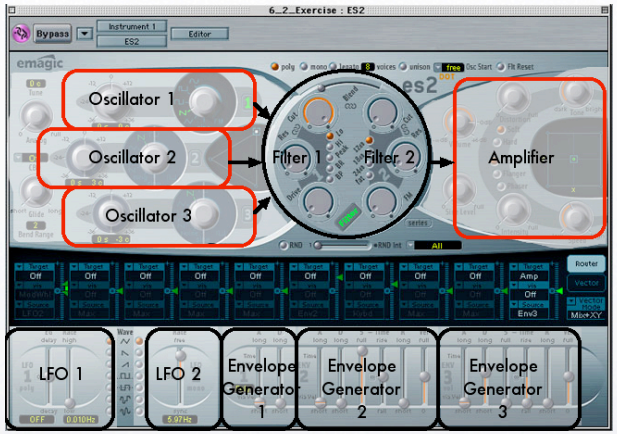
Retro Emulations

- Hard-wired synthesizers modeled after physical instruments

Modern Approaches: Emagic ES-2 Interface

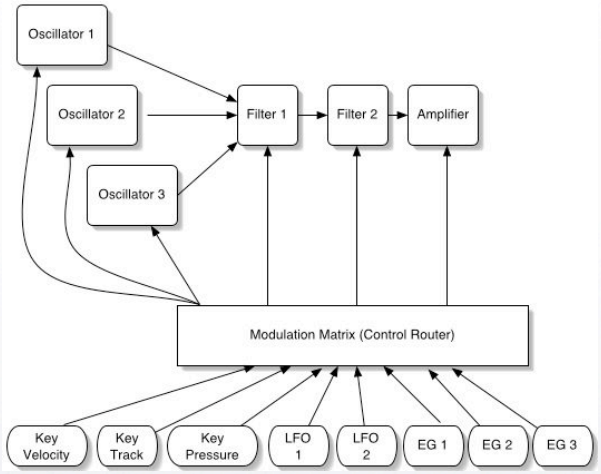
- Modeled after synthesis functionality

Modern Approaches: Emagic ES-2 Interface



- Modeled after synthesis functionality

Modern Approaches: Emagic ES-2 Interface



- Modeled after synthesis functionality
- The Block Diagram of signal flow

Modern Approaches: Emagic ES-2 Interface

True Modular Instruments

- User-configurable modular synthesizers


System Performance

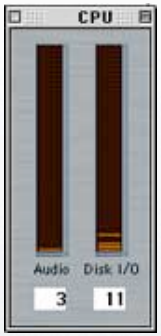
- Minimize I/O Latency
- Saving process cycles
  - Channel Inserts vs Busing
  - Freezing Tracks
- CPU Monitoring


System Configuration

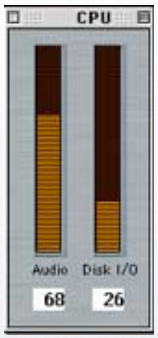
- Driver settings
  - Latency - the time between input and output
  - I/O Buffer - holds data in transfer between audio hardware and CPU
  - Disk buffer - holds data in transfer between disk and CPU
  - Process buffer - Holds data in transfer between host application and CPU (for DSP processes)

Inserts vs Busing

- Channel Inserts give great control for each musical part but tax the processor
- Effects busing gives less individual control but is a very efficient use of the processor



CPU performance load using all channels bussed to a single reverb



CPU performance load using individual reverbs inserted on all channels

Day 2: Producing Music with Logic


Producing Music with Logic: Process

- Musical Idea
- Recording
- Editing
- Mixing
- Mastering

Definitions:Buzzwords 101

- S/PDIF - the Sony/Phillips Digital Interface Format. Unidirectional stereo over coaxial cable. May also be sent via optical cable.
- Coaxial - Two wires, the ground wrapped around the hot in a single sheath.
- Optical - the transmission of signal as light pulses within a fiber tunnel.
- ADAT - Invented for the Alesis Digital Audio Tape system. Also known as lightpipe, 8 channels of audio sent unidirectionally over optical cable.
- TDIF - Tascam Digital Interface Format
- AES/EBU - Audio Engineering Society, European Broadcast Union standard for unidirectional stereo audio over three cable connectors (XLR).
- CD (Compact Disc) - 44kHz sampling at 16 bit resolution
- HD (High definition) - Usually refers to 192kHz sampling at 24 bit resolution



And More Buzzwords

- Latency - the time between between input and output, usually measured in milliseconds
- Buffer - a temporary memory space for holding data during high speed transfer (usually between disk and CPU or I/O and CPU)
- ASIO - Audio Stream In/Out, a Steinberg standard for audio communication between host applications and audio hardware
- VST - Virtual Studio Technology, owned by Steinberg, a standard for cross-platform audio extensibility
- TDM - Time Domain Multiplexing. Digidesign's audio extensibility format
- RTAS - Real-Time Audio Suite - Digidesign's extensibility format for non-TDM systems
- MAS - Motu Audio System - MOTU's proprietary extensibility format for native audio

File Formats

- Standards
  - SDII
  - AIFF (.aif)
  - WAV (.wav)
  - MP3
  - Apple Loops
  - OMF
  - QuickTime (.mov)
  - Standard MIDI File (.mid)

Plug-in Formats

Format	Use	Supported
VST	General Native Processing	x
MAS	Mark of the Unicorn-specific native processing	x
TDM	Specialized hardware DSP from Digidesign	√
Audio Units (AU)	Generalized OSX native processing	√
Premier	Non-real-time destructive native processing	x
AudioSuite	Non-real-time native processing	x
RTAS	Real-Time Audio Suite: Generalized native Processing	x